Software Development Principles

Lecture 3
Definitions

Lecturer:

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Topics

- Introduction to Definitions
    - No Arguments
    - No Returns
- Definitions with Arguments
    - Single Arguments
    - Multiple Arguments

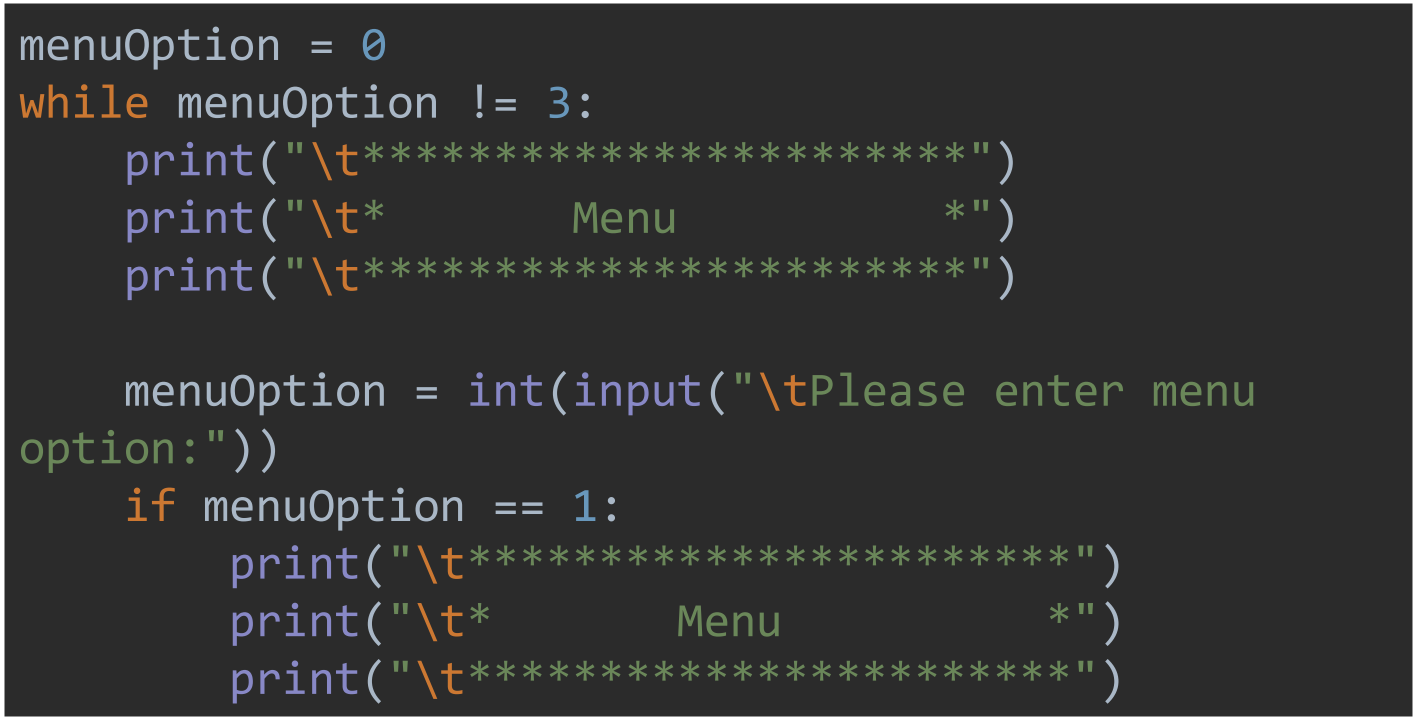
Python Definitions

- Writing code sometimes requires the reuse of code.

- This has two issues associated with it:
    - Time consuming
    - Erroneous due to copy and pastings code

- Also our current method of development does not allow for individual code to be developed and then brought together in a standardized practice
    - Could try and insert into code
    - Could take longer than writing code individually
    - Could lead to very erroneous code, with a large amount of bugs
    - Example: Variable naming schemes by two users may be very different

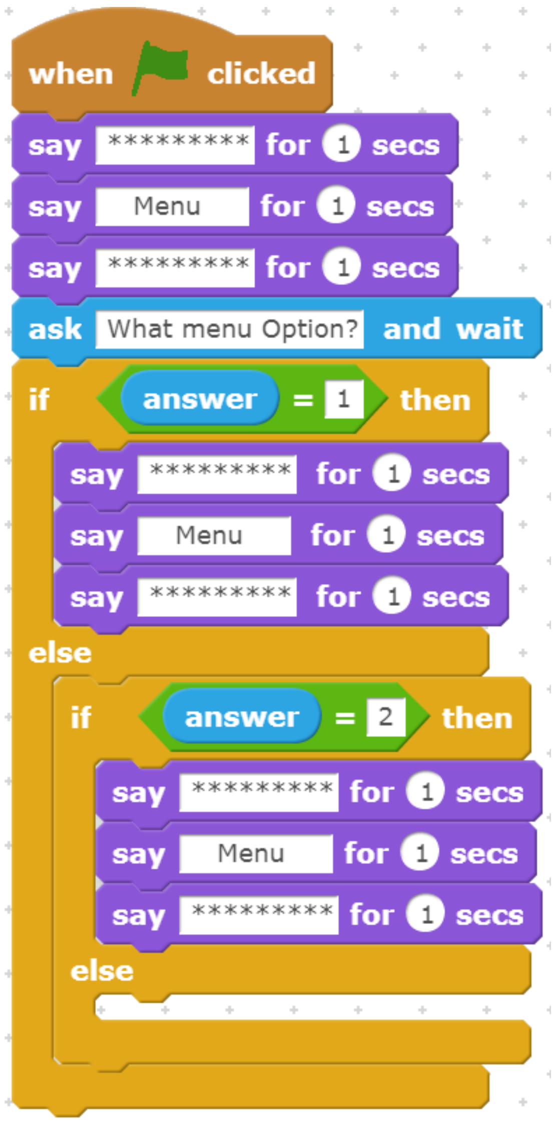
Example 1:



```
menuOption = 0
while menuOption != 3:
    print("\t***********************")
    print("\t*       Menu          *")
    print("\t***********************")

    menuOption = int(input("\tPlease enter menu
option:"))
    if menuOption == 1:
        print("\t***********************")
        print("\t*       Menu          *")
        print("\t***********************")
```

- There may be a case that Menu’s may need to be printed multiple times.
- This introductory example, is a good use case for Definitions

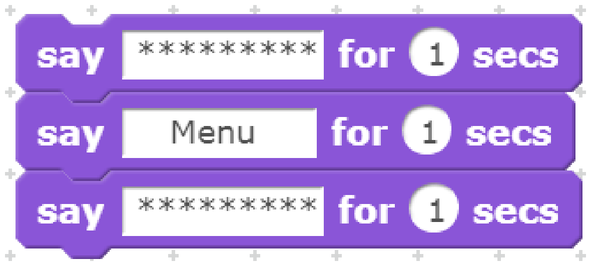
Example 1:



```
when [flag] clicked
say ********* for 1 secs
say Menu for 1 secs
say ********* for 1 secs
ask What menu Option? and wait
if answer = 1 then
    say ********* for 1 secs
    say Menu for 1 secs
    say ********* for 1 secs
else
    if answer = 2 then
        say ********* for 1 secs
        say Menu for 1 secs
        say ********* for 1 secs
    else
```

- Before we look at Python, the same problem can exist in all other languages, even Scratch!

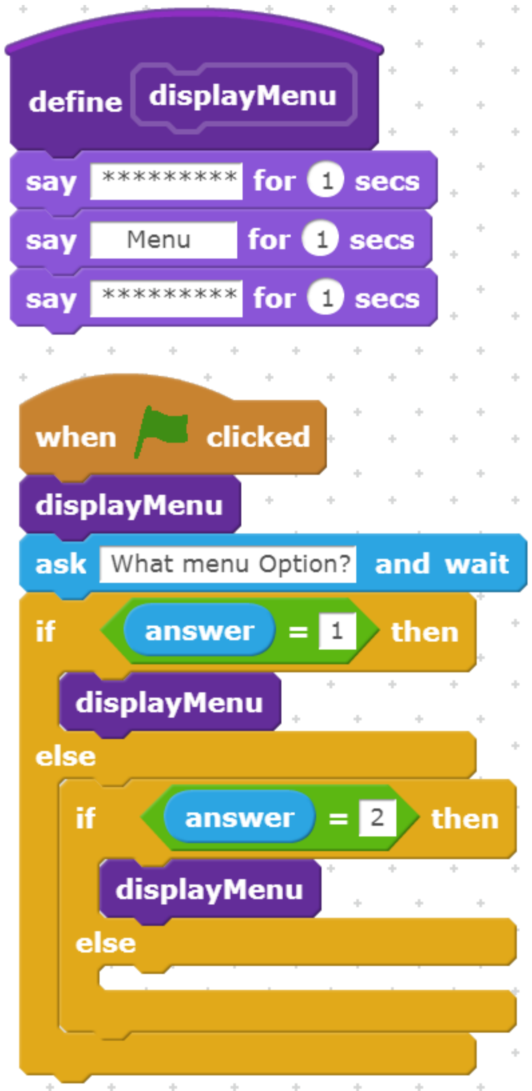
- The below block is repeated multiple times.



```
say ********* for 1 secs
say Menu for 1 secs
say ********* for 1 secs
```

Example 1:

- We can "Define" a block and use it many times in the code.
- The definition on its on, will not run.
- The definition must be called.
- Python must know that it exists.
- As Python runs as a script line by line, the definition ***MUST*** be written before the code that calls it.



```
define displayMenu
say ********* for 1 secs
say Menu for 1 secs
say ********* for 1 secs

when [flag] clicked
displayMenu
ask What menu Option? and wait
if answer = 1 then
    displayMenu
else
    if answer = 2 then
        displayMenu
    else
```

Example 1:

- A Definition in Python is written as follows:

Definition

Calling Definition

```
def display_menu():
    print("\t***********************")
    print("\t*       Menu          *")
    print("\t***********************")


menuOption = 0
while menuOption != 3:
    display_menu()
    menuOption = int(input("\tPlease enter menu 
option:"))
    if menuOption == 1:
        display_menu()
```

Definitions: Structure

- A Definition in Python is written as follows:

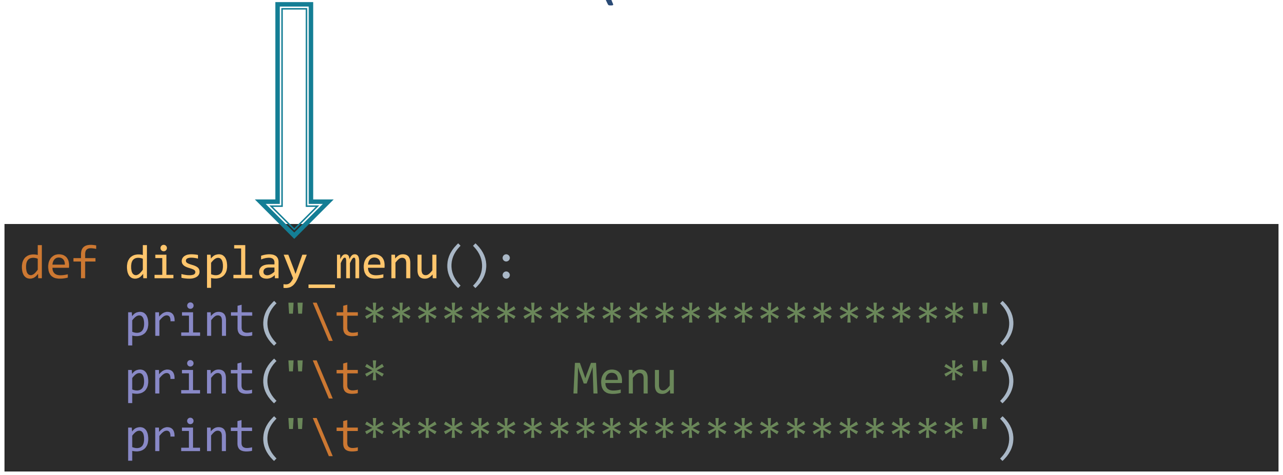
Structure Type

```
def display_menu():
    print("\t***********************")
    print("\t*       Menu          *")
    print("\t***********************")
```

Definitions: Structure

- A Definition in Python is written as follows:

Definition Name (Convention is all lower case)

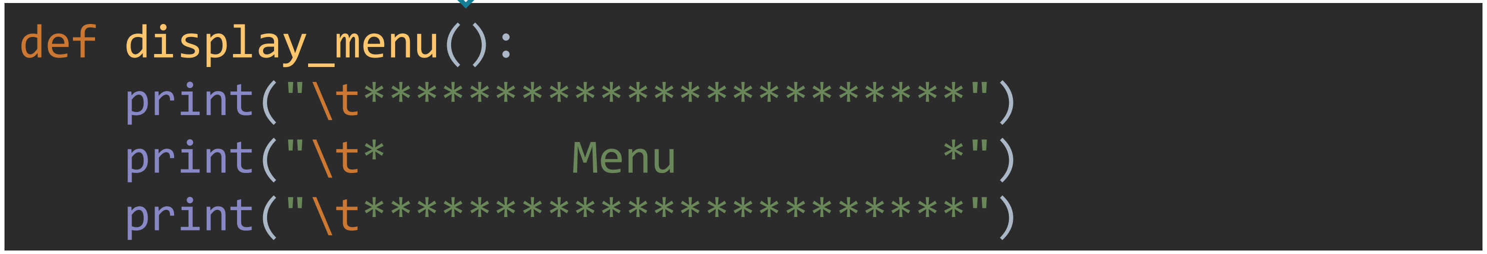


```
def display_menu():
    print("\t***********************")
    print("\t*       Menu          *")
    print("\t***********************")
```

Definitions: Structure

- A Definition in Python is written as follows:

Definition Arguments (in this case, there are none)



```python
def display_menu():
    print("\t************************")
    print("\t*       Menu           *")
    print("\t************************")
```

If no arguments, you still require the ( )

Definitions: Structure

- A Definition in Python is written as follows:

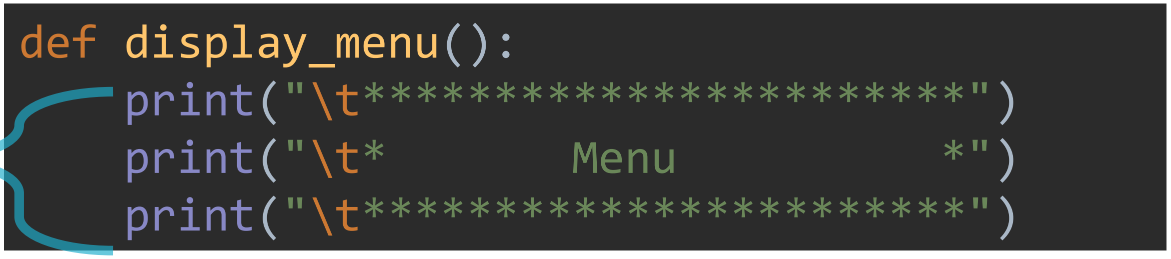
Definition Begin   Similar to `for` and `while & if`

```
def display_menu():
    print("\t************************")
    print("\t*       Menu           *")
    print("\t************************")
```

Definitions: Structure

- A Definition in Python is written as follows:

Definition Code



```
def display_menu():
    print("\t************************")
    print("\t*       Menu           *")
    print("\t************************")
```

Uses indentation (Similar to `for` and `while & if`)

Definitions: Class Example 1

- Write a Python Definition that displays the value of PI (22.0 / 7.0):
- Use a Loop to iterate 5 times to print out the value, using the definition:

Definitions: Solution 1

- Write a Python Definition that displays the value of PI (22.0 / 7.0):
- Use a Loop to iterate 5 times to print out the value, using the definition:

```
def display_pi():
    Pi = (22.0 / 7.0)
    print("Pi = ", Pi)


for i in range(5):
    display_pi()
```

Definitions: Class Example 2

- Write a Python Definition that displays the current time (including seconds)
- Use a Loop to iterate 5 times to print out the value, using the definition:

```
import time
timeNow = time.strftime("%H:%M:%S")
```

Definitions: Solution 2

- Write a Python Definition that displays the current time (including seconds)
- Use a Loop to iterate 5 times to print out the value, using the definition:

```python
import time

def current_time():
    timeNow = time.strftime("%H:%M:%S")
    print(timeNow)


for i in range(5):
    current_time()
```

Definitions: Arguments

- Useful to be able to “send additional data” to the Definition.
- When a definition **is** called, the **arguments are** the data you pass into the definition’s parameters.
- **Parameter is** the variable in the declaration of the Definition.
- **Argument is** the actual value of this variable that gets passed to Definition.

Note: Python does allow access to variables when using Definitions (unlike Java or C# where there is variable scope), we will use a mix of both for good practice.

Definitions: Arguments

- We can “pass” in a value to a Definition, inside the () brackets.
- We already to this on a regular basis

```
print("Hello")
```

- Lets print a value using an argument (our own version of print!)

```
def my_print(stringIn):
    print(stringIn)


my_print("Hello")
```

Definitions: Arguments

- Lets step through the code:

```
1) def my_print(stringIn):
2)     print(stringIn)


3) my_print("Hello")
```

1) created a Definition with one argument => stringIn

Definitions: Arguments

- Lets step through the code:

```
1) def my_print(stringIn):
2)     print(stringIn)


3) my_print("Hello")
```

2) The code uses the Argument `stringIN` as a local variable (Not visible outside Definition : Scope)

Definitions: Arguments

- Lets step through the code:

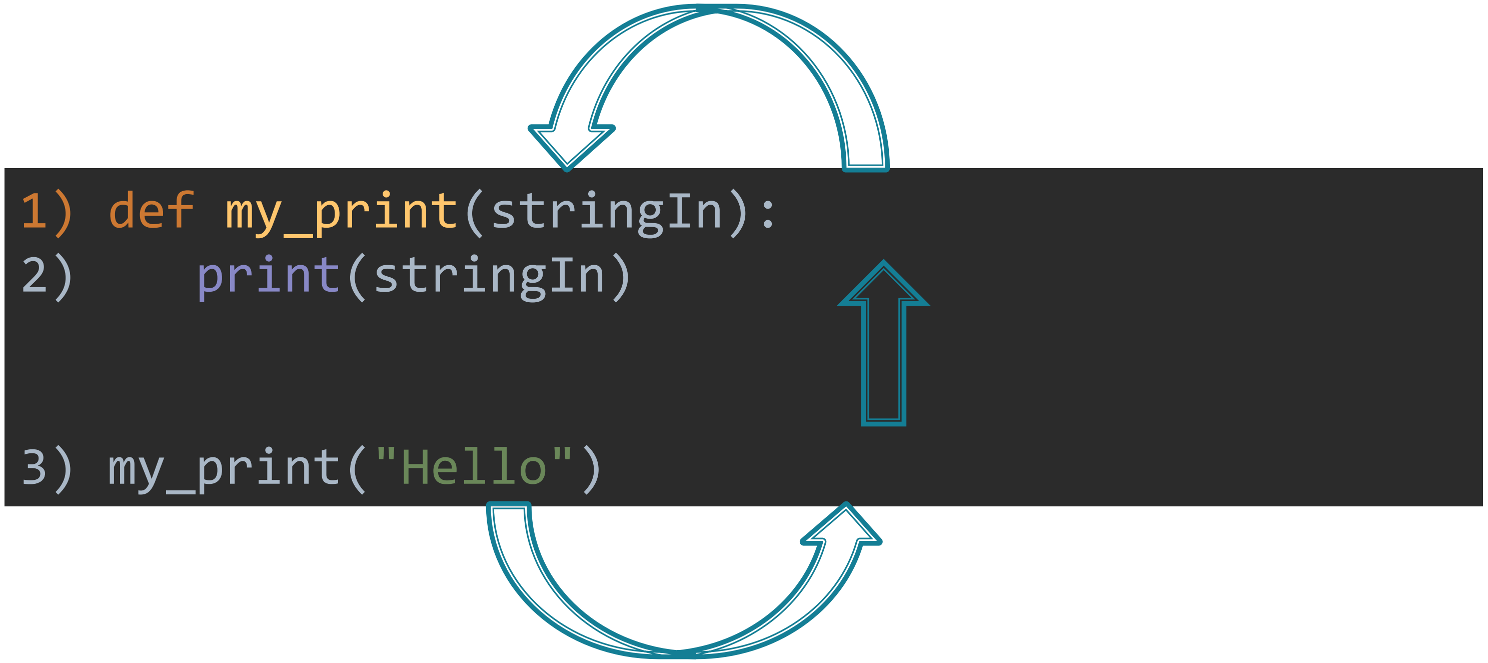
```
1) def my_print(stringIn):
2)     print(stringIn)


3) my_print("Hello")
```

3) The code calls the Definition and sends the string `“Hello”` to the Definition as an argument. This is then locally stored as `stringIn`. Then on line two of the code, the print uses the local variable `stringIn` (with a value `“Hello”),` and prints it to the screen.

Definitions: Arguments

- Lets step through the code:

stringIn = “Hello”



```
1) def my_print(stringIn):
2)     print(stringIn)


3) my_print("Hello")
```

Definitions: Class Example 3

- Write a Python Definition that has one Argument, a number, it squares the number and prints it to the screen.
- The user must enter the number to be passed into the Definition.

Definitions: Solution 3

```python
def square_number(numberIn):
    ans = numberIn * numberIn
    print(ans)


number = float(input("Please enter number to be squared:"))
square_number(number)
```

Definitions: Multiple Arguments

- The following Definition has two arguments:

```python
def my_print(stringIn, numberIn):
    print(stringIn * numberIn)


my_print("Hello“, 3)
```

1) created a Definition with two Argument’s => stringIN, number

Definitions: Multiple Arguments

- The following Definition has two arguments:

```
def my_print(stringIn, numberIn):
    print(stringIn * numberIn)


my_print("Hello“, 3)
```

- Definitions can have multiple Arguments
- Separated by a comma (,)
- They can be the same type or different types

Definitions: Class Example 4

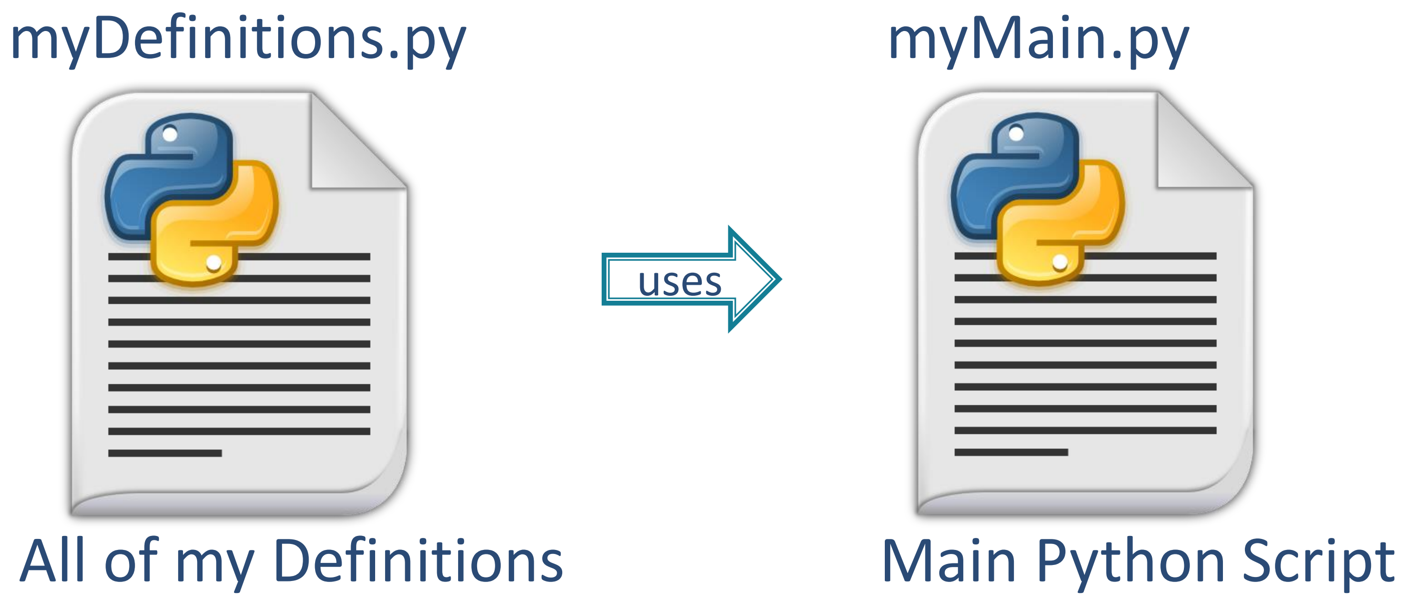
- Write a Python Definition that has two Argument, both numbers.
- The user must enter both numbers to be passed in as Arguments.
- The Definition prints the largest of the two numbers.

Definitions: Solution 3

```python
def largest_number(number1_in, number2_in):
    if number1_in > number2_in:
        print("The largest number is :", number1_in)
    elif number2_in > number1_in:
        print("The largest number is :", number2_in)
    else:
        print("The two numbers are equal")


number1 = float(input("Please enter first number:"))
number2 = float(input("Please enter second number:"))

largest_number(number1, number2)
```

Definitions: Separate .PY file

- A useful tool for reusability is separating your Definitions into a separate Python file.

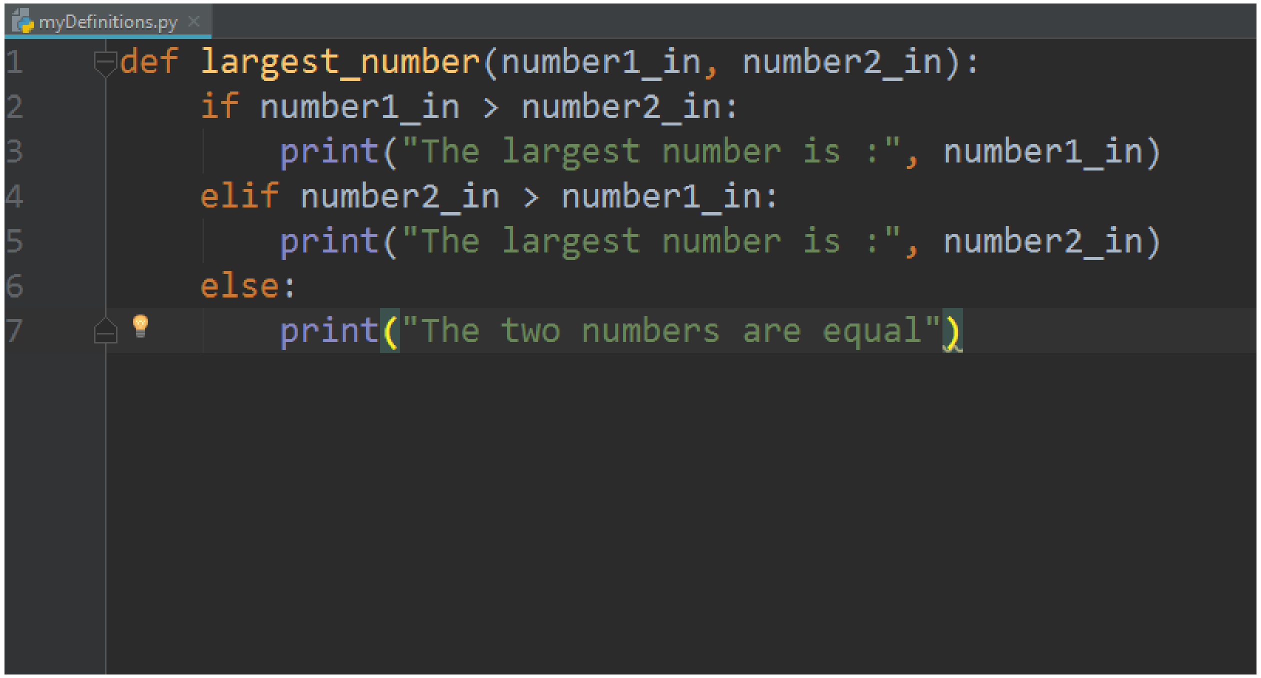


Definitions: Separate .PY file

- A useful tool for reusability is separating your Definitions into a separate Python file.

myDefinitions.py

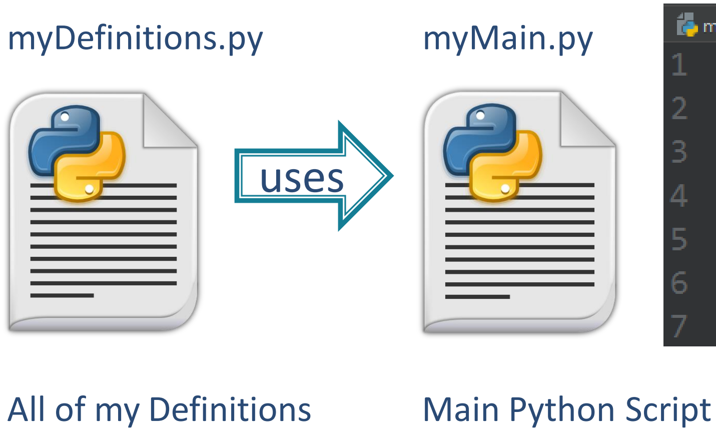
All of my Definitions

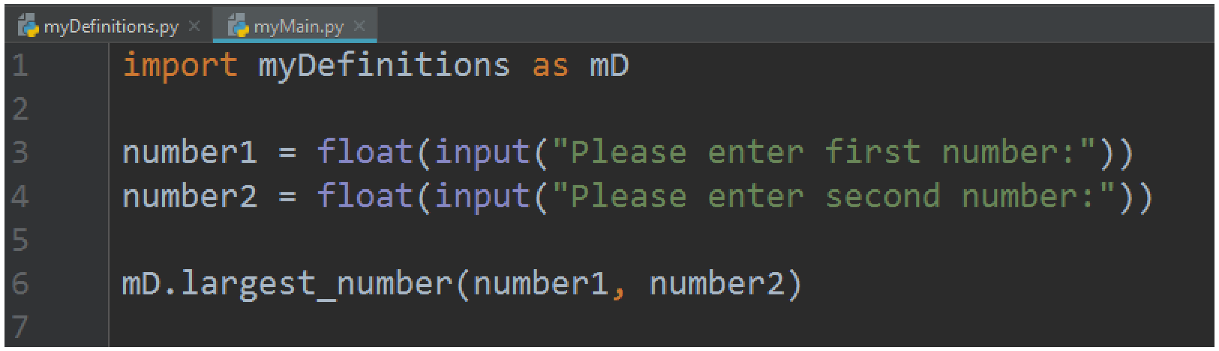


```python
def largest_number(number1_in, number2_in):
    if number1_in > number2_in:
        print("The largest number is :", number1_in)
    elif number2_in > number1_in:
        print("The largest number is :", number2_in)
    else:
        print("The two numbers are equal")
```

Definitions: Separate .PY file

- A useful tool for reusability is separating your Definitions into a separate Python file.

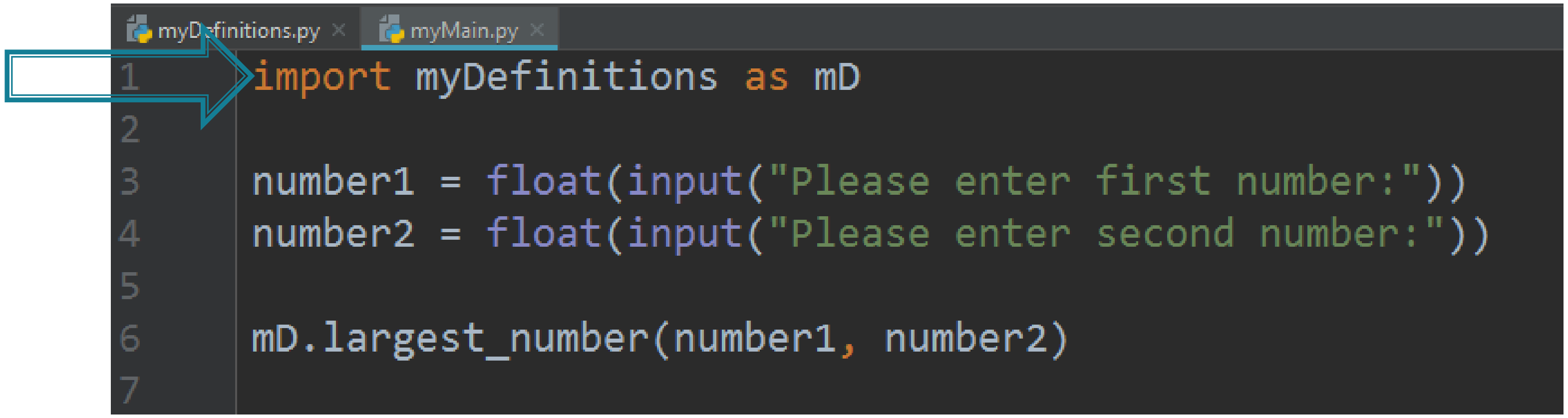




```python
import myDefinitions as mD

number1 = float(input("Please enter first number:"))
number2 = float(input("Please enter second number:"))

mD.largest_number(number1, number2)

```

Definitions: Separate .PY file

- A useful tool for reusability is separating your Definitions into a separate Python file.

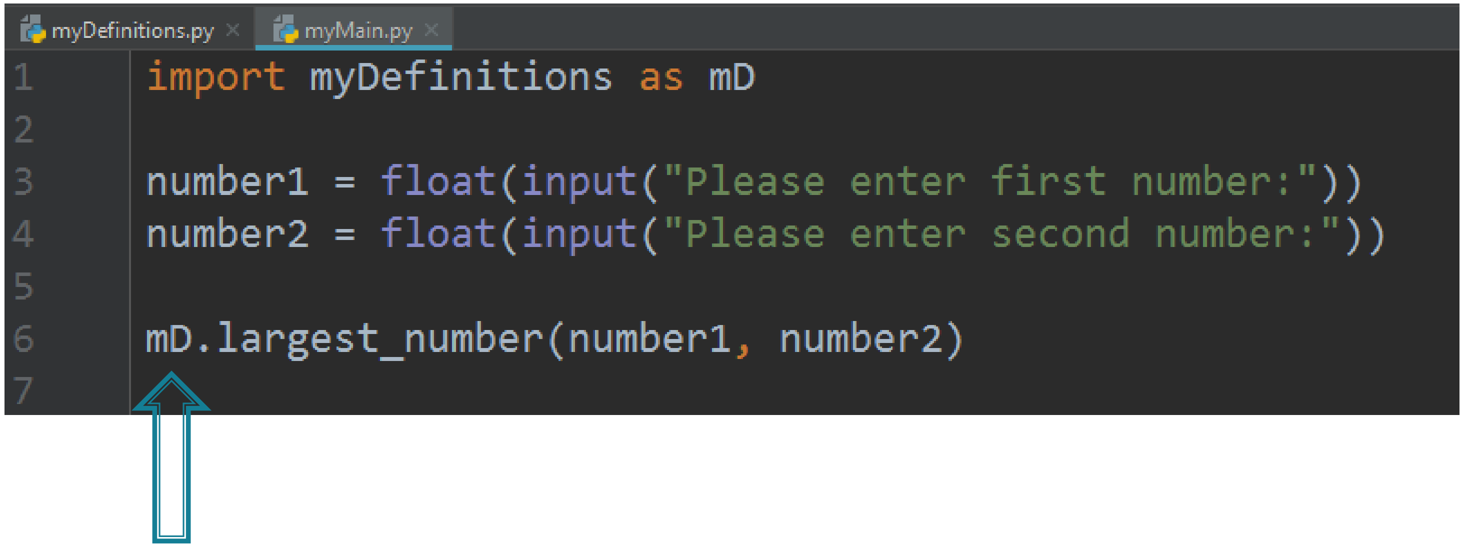


```python
import myDefinitions as mD

number1 = float(input("Please enter first number:"))
number2 = float(input("Please enter second number:"))

mD.largest_number(number1, number2)
```

- Import, just like time, must use as

Definitions: Separate .PY file

- A useful tool for reusability is separating your Definitions into a separate Python file.



```python
import myDefinitions as mD

number1 = float(input("Please enter first number:"))
number2 = float(input("Please enter second number:"))

mD.largest_number(number1, number2)
```

- Also need to use mD